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ABSTRACT

Automated office technologies, such as office automation systems, management information systems, teleconferencing, message systems, and robotics, are providing momentum for the trend towards the "paperless office" by allowing new means of carrying out office tasks and aiding in the management of time, data, and messages. The success of these systems depends on how effectively they are introduced into the office. Such efforts as solicitation of employee input are needed to overcome resistance to change and encourage acceptance of the new technology. The potential impact of a new technology should be studied both at the micro level (of the individual and his/her performance changes, job satisfaction, stress level, and attitude toward the job and the technology), and at the macro level (including changes in organizational efficiency, departmental interactions, quality of work life, and changing patterns of work). Potential impacts can be either positive or negative. Positive impacts include improved intellectual performance, increased work discipline, reduction in wasted time, increased efficiency, increased timing and control, increased visibility, increased quantity and quality of work, increased flexibility of time and location of work, and improved quality of work life. Negative impacts include boredom, problems of dependency and stress, feelings of isolation, decrease in organizational loyalty, decrease in quantity and quality of social interactions, and decrease in the quality of work life. The task of the human resources development/management professional is to investigate the changes that are occurring throughout the organization in order to aid workers in integrating the new technology into their work lives. (KC)

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New Technology Implementation and Use: Workers' Attitudes and Behaviors

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New Technology Implementation and Use:
Workers' Attitudes and Behaviors

The efforts of American business to improve this country's productivity have included a growing emphasis on improving white collar efficiency through the use of automated office systems. The increasing role ofthese new systems and their related technologies in the workplace demands a concurrent emphasis on the study of the technology and its psychological and behavioral impacts on the organization's members.

The purpose of this paper is to:

1. Briefly review the most common new technologies.
2. Discuss new technology implementation as a change process, and the causes of resistance to change.
3. Briefly review methods of evaluation, and an evaluation study that was conducted to investigate the impacts of a new office technology.
4. Discuss the positive and negative impacts of new technologies.
5. Discuss the implications the potential impacts have for human resource development and human resource management profesisonals.

Types of New Technologies

Automated office technologies are providing momentum for the trend towards the "paperless office" by allowing new means of carrying out office tasks, and aiding in the management of time, data, and messages. Managerial jobs, clerical jobs, and manufacturing jobs are undergoing dramatic changes as a result of technologies and systems such as automated office systems, information systems, teleconferencing, messaging systems, and robotics. To familiarize the reader with these terms, this section

contains a brief description of the most common technologies.

Office automation systems (OAS) are integrated computer systems which support administrative functions. Administrative tasks such as data creation, data processing and the storage of information can now all be done via the computer.

A computer-based system which supports the management functions is commonly referred to as a **management information system (MIS)** . An MIS is a data base in which all related information is centralized. Examples of an MIS are decison support systems (DSS) which aid in the decision making process, and human resource information systems (HRIS) which can be used for human resource planning, needs analysis, compensation management, and EEO/AA report generation.

Teleconferencing is receiving increased attention as a means to bring several groups of people together via the electronic transfer of images and information. Through a combination of video and audio equipment, electronic blackboards, and computer terminals, business meetings and training programs can be conducted without the participants leaving their home base. The proclaimed advantages of teleconferencing include the savings of time and money and an increase in the efficiency of delivery.

A common component of automation systems is a store and

forward **messaging system** . These messaging systems can be activated using a visual display terminal (VDT) or a push-button telephone. Electronic mail uses a VDT and users can communicate with anyone who is part of the system. The message is generated by one person via the VDT and is then "delivered" to the recipient. When the recipient accesses the EM system, he/she will be informed that a electronic memo has been delivered.

Voice mail is a type of store and forward messaging system that utilizes a telephone, a computer, and a recorded. Voice mail is similar in principle to electronic mail, except that all messages are sent and received using the telephone. The advantages of voice mail over electronic mail include the fact that most people have constant access to a telephone, whereas the VDT is found primarily in one's office. Also, telephones are more easily accepted by managers, whereas there is a reluctancy of many to use a computer terminal.

Robotics , the last technology to be discussed is found primarily in the manufacturing setting. Robots are electro-mechanical devices which can be programmed to perform a variety oftasks. In addition to being immune to fatigue and boredom, these devices can be used in areas or on jobs that are typically hazardous for human beings.

Although not all organizations have introduced sophisticated technolgies, it has been estimated that by

1986, businesses will spend $1 trillion on information processing equipment. While the information services or telecommunications staff is developing budgets and schedules, the behavioral science professionals should be actively preparing organizational members for the introduction of the equipment, and the subsequent changes that will occur.

Implementation of New Technologies: Introducing Change

It is not the actual hardware that is the deciding factor in the success of a new office system or technology, but the effectivenesss with which the system is implemented in the workplace. To minimize the amount of resistance and fear on the part of the employees, the implementation process requires the same care and attention that other major organizational change efforts receive. The implementation plan must have as its goal the integration of both the human system and the technological system. Knowledge of human behavior and organizational development practices are critical at this phase to ensure a smooth transition with a minimimum of organizational disruptions.

The implementation of a new technology has the potential to be met with the same resistance as any other change in the organization. If it is viewed as a basic change process and the appropriate steps and precautions are taken, a smooth and successful implemenation will occur.

Lewin's (1947) three phases of change (unfreezing, change, refreezing) provide a useful framework for

structuring the implementation process. The first phase, "unfreezing", is the period during which organizational members begin to feel and recognize the need for change. Included in this phase may be the assessment of automation needs. Eliciting workers' input regarding tasks and areas to be automated is one way in which potential users can take a proactive role in the change process. During the "unfreezing" phase, people begin to psychologically prepare themselves for the change as they begin to recognize the potential uses for new technologies and the ways in which their own performance and productivity may be improved.

The introduction of the new technology comprises the "change" phase. Maximum user involvement is critical here to ensure acceptance by the prospective users. Organizational members can be encouraged to play an active role in the change process by including them in the design of the system, holding frequent staff meetings at which they are provided with progress reports, and allowing them to meet with vendors. "Refreezing" is the final phase of the change process. Providing users with the opportunity to experiment and adapt the newly learned behaviors to their jobs will reinforce the new behaviors and facilitate the development of a support system.

Causes of Resistance to Change

The introduction of change in an organization, whether it is a new technology or a new reporting procedure, has the potential for creating stress and resistance among the

affected individuals. This resistance can be minimized if an appropriate change process is instituted and the change agent is cognizant of the factors that may be contributing to this resistance.

Galitz and Cirillo (1983) discuss the most common causes of resistance to change and relate these to the introduction of a new technology. By designing an implementation process which recognizes each of these causes, resistance can be minimized, and there will be a greater probability of user acceptance.

A common factor contributing to resistance is **loss of control** . If the new system is viewed as constraining the manager's personal control or creativity, or decreasing his/her discretion in performing managerial tasks, the manager may experience a sense of loss of control over the work environment. Prospective users may also experience **feelings of inadequacy** . These result from a person's anxiety about his/her own ability to effectively use the new technology. As with many new situations, an individual may experience both fear of the unknown and fear of failure. Individuals who have never worked with a computer may fear the computer itself, (this has been refered to as "computerphobia" or "microphobia") or fear that they will be unable to develop the requisite skills necessary to effectively use the new equipment.

Individuals may also resist a new technology when **psychological habits** must be broken and replaced by new

procedures and behaviors. How many times has it been said "We've always done it this way", when what is really meant is "We've never wanted to change"?

Automated offices, electronic messaging systems, and information systems all affect the communication and interaction patterns within the organization. Dramatic decreases in interpersonal interaction, particularly face to face communication, can result in feelings of isolation on the part of the users. New changes require closer supervision, and this, too, can create resentment on the part of the user. Instead of viewing this closer supervision as being supportive, the independent worker may interpret it as beingthreatening, or possibly, insulting. Dissatisfaction with these **disturbed relationships** may also result in resistance to change.

The final factors contributing to users' resistance to change are **lack of understanding of the change and a lack of identification** with it. These can be avoided if individuals are made to feel a part of the change process through activities such as weekly staff meetings or participation on a task force. By maximizing their involvement, the users will be more knowledgeable of the purpose of the change and its potential benefits. Users' acceptance of the change is critical to its success, and it is through their active involvement that this will occur.

Evaluating the Impacts of New Technologies

Studying the impacts of new technologies involves more

than measuring the cost savings and the productivity improvements. While these are the main objectives of automation, they are not the sole outcomes. The potential impact of a new technology can be studied at both levels of the organization. Investigating the impacts at the micro level includes studying the individual and his/her performance changes, job satisfaction, stress level, and attitude toward the job and the technology. Macro level impacts would include changes in organizational efficiency, departmental interactions, quality of worklife, and changing patterns of work.

These impacts should be of significant interest to the organization and can be studied using a variety of research methods. It is not the intent of this article to provide a detailed discussion of research methods, but it should be recognized that these methods can differ substantially in terms of cost, time, level of analysis, and ease of analysis.

Interviews and observation are, of course, common methods of data collection. These methods may be particularly helpful during the early stages of use to identify specific problems or areas of potential difficulty. Questionnaires are valuable instruments for studying factors such as job satisfaction, role problems, stress, attitude toward the change and quality of work life.

Another source of valuable information, and ideal because of its unobtrusive nature, is archival data. These

data which are generated without the intervention of the researcher. Personnel records, financial records, calendars, logs, and amount of computer time used are examples of archival data. A major advantage to this type of data collection is that workers are not "imposed upon" to provide the necessary information. This minimizes the threat of contaminated data resulting from purposely modified behavior.

There are a variety of data collection methods and research strategies which can be used to evaluate the impacts of new technolgies. The next section contains a brief overview of a study which investigated the impacts of a new communication technology. The reader should refer to the original source for the details of the study. (Licata, 1982).

The Evaluation of a Voice Mail System: An Exploratory Study

As described earlier, Voice Mail is a store and forward messaging system. By accessing the Voice Mail System (VMS) a user can listen and respond to his/her voice messages, or send messages to other users. This study was undertaken to investigate the impact of a VMS on the members of a large manufacturing organization. The four major objectives of the research were to study the: (1) use of the VMS; (2) user satisfaction with the VMS; (3) impact of the VMS on the worker; and (4) determinants of use of and satisfaction with the system.

The organization involved in the study had recently purchased a voice messaging system and was interested in the users' acceptance of the VMS and the users' perceptions of its benefits. Two hundred and thirty three of the 500 users volunteered to participate in the study. This sample represented all levels in the organization, and included users from nine departments.

There were two methods of data collection used in this study: (a) a 42 item questionnaire which measured the users' satisfaction with the VMS and their perceived impacts and benefits of the VMS and (b) system generated data. The survey was mailed to the 500 VMS users and 233 questionnaires were returned (47% response rate). Data were also collected on the subjects' use of the VMS over a one month period. These included the number of times the subject called the VMS, the number of messages sent, and the number of messages received.

The results of the study indicated a strong relationship between an individual's use of the system and his/her satisfaction with the system ($r=.51$; p .001). Although this was a significant relationship, no causality was established between the two variables. In other words, it was not determined whether VMS use increased as the users became more satisfied with it, or whether as they used the system more, they became more satisfied.

Also strongly related to user satisfaction was the perceived impact of VMS on the user's job ($r=.80$, p .001).

The impact of the VMS was an aggregate measure of responses to items related to factors such as increases in productivity, decreases in "shadow functions" (nonproductive uses of time), and increased accessibility of organizational members. A positive relationship existed between the extent to which the subjects felt the VMS positively effected their job, and their satisfaction with the VMS.

A variable of much interest in this study was the accessibility of organizational members. According to the communication literature, workers most frequently use the information source that is most accessible to them, rather than the source from which they would obtain the best information. Pfeffer and Salancik (1977) and more recently O'Reilly (1982), have proposed that the quality of information may be sacrificed in exchange for the expediency of its receipt. This suggests that accessibility may be the prime determinant of information source selection, rather than the quality and accuracy of the information received.

In the present study, a significant relationship existed between the users' perception of the increased accessibility of organizational members and VMS use ($r=.49$, $p < .001$) and satisfaction with VMS ($r=.67$, $p < .001$). Thus, effective use of the VMS may result in the increased accessibility of organizational members as information sources. Subsequently, the quality of information received should then become the primary criterion for information source selection, rather than the accessibility of the

source.

Another interesting relationship emerged between VMS use and the organizational level of the user. The hypothesis of a positive relationship between level and use was not supported, but it was shown that there was a significant difference in use between organizational levels. VMS use was the greatest among supervisors, and significantly less among the managers, clerical workers, and technicians.

This study revealed not only several statistically significant relationships, but also provided insight to the factors that have the potential to play a major role in the successful use of a large scale office system. Acceptance of the system, appropriate training, a need to communicate with others, and realistic expectations of benefits, are examples of those variables which will influence the degree to which the VMS is used.

The Potential Impacts of New Technologies on the Users

The new technologies being introduced to the workplace have the potential to signifcantly alter the work environment. Modification of the type of tasks to be performed, and the ways and location in which they are performed are examples of the changes that will affect the psychological and physical well-being of workers.

The Positive Impacts

The positive changes that are likely to occur as a result of new technolgies are discussed in this section.

Improved intellectual performance. The use of new

technologies such as management information systems and word processing, will allow the user greater potential for information processing, decision making, and problem solving (Uhlig, Farber, & Bair, 1979).

Increased work discipline. Greater accessibility to information and ease of acessibility will improve the manager's ability to complete his/her tasks in a more effective and efficient manner. Increased discipline will also be facilitated by minimizing the interuptions by others seeking information. Information systems will provide alternative sources of information and messaging systems will provide alternative modes of inquiry. (Uhlig, et. al.).

Reduction in "shadow functions". Shadow functions are unproductive uses of time such as traveling time, being interupted, and making telephone calls which are disconnected, unanswered, or answered by another party. Through the use of technologies such as voice mail, electronic mail, and teleconferencing, managers will be able to minimize the amount of time wasted.

Increased efficiency. A reduction in the media transformations of written materials (e.g. write, type, revise, retype), time spent traveling, and time spent searching for documents will result in more efficiently performed tasks. Information systems, messaging systems, and word processing will also improve the efficiency of secretaries, and decrease the amount of time in which they

are idle. It has been estimated that secretaries' idle time is almost 20%. This is through no fault of their own, as much of this time is spent waiting for work.

Increased timing and control. Automated office systems provide the user with increased control over the retrieval and flow of information. This allows more timely decision making, report generation and information dissemination. (Uhlig, et. al.).

Increased visibility. Users performance improvements resulting from the effective use of new technologies may lead to increased exposure to peers and superiors. In addition, the appropriate use of messaging technologies may allow the user greater contact with and accessibility to others.

Decreased visibility, however, may also occur. This may be perceived as a problem, if as a result of teleconferencing or messaging systems, the user's face to face interaction with superiors and peers greatly decreses. This is an concern particularly for users that work at home.

Increased quantity and quality of work. If projected productivity increases are realized, the quantity and quality of a user's work will be greatly increased. This may result in increased productivity of the work unit, or the maintenance of the present level of productivity with fewer workers.

Increased flexibility with time and location of work. Computer technology is facilitating the creation of

work alternatives such as work satellite stations, working at home, or modified work schedules. Employees are now able to work at home and be linked to the office computer system by telephone lines.

Improved quality of work life. The flexibility provided by new technologies is making a major contribution to the improvement of many employees' quality of work life. Many of the new technologies are allowing individuals to work at home, reduce the amount of time spent traveling, and have greater access to people and information.

The Negative Impacts on Individuals

There are also negative outcomes of increased automation. The recognition of these potentially negative impacts, will allow for the development of an implementation process which minimizes the detrimental effects on the users.

Potential Boredom. Boredom is a potential problem whether the technology being used is robotics or an office system. Automation of tasks may reduce the variety of a person's job, consequently creating boredom. For example, a secretary who has been placed in a word processing unit may no longer be performing tasks such as greeting clients, or scheduling appointments.

Problems of dependency and stress. As workers' jobs become more dependent upon the use of technology, the workers themselves may experience an increased level of stress. Part of this may be due to the lack of control one feels over the system. Pressure to meet deadlines,

destroyed files, program bugs, and the inaccessibility of the system may all create stress for the user. Another source of stress may be the increased pressure (created by the superior or the individual) to improve productivity.

It is anticipated that clerical workers will experience increased stress due to the new demands placed upon their jobs. Although they may experience increased task variety and the opportunity to serve more people, they will need to be given a sufficient amount of time in which to develop new skills.

Feelings of isolation. The positive effects of automation and information systems such as increased geographic flexibility and decreased dependency on others, may also lead to a sense of isolation for the user. As face to face interaction decreases, people begin working at home, or organizational members see less of their colleagues, users may begin to feel shut off from the rest of the organization. Secretaries who are placed in word processing pool may feel they have lost their identity or may feel they have lost the prestige of being associated with a particular manager(s).

Decrease in organizational loyalty. While the worker may experience increased flexibility in terms of workplace and schedule, there may be a decrease in the affiliation or loyalty the user feels for the organization. Increased autonomy of workers may lead to identification with the profession rather than the organization, and as a

result "team spirit" or group cohesiveness may be threatened.

Decrease in quantity and quality of social interactions. Individuals who have a high need for affiliation may become increasingly dissatisfied as the amount of face to face interaction decreases, and the time spent with the technology consumes a major portion of the day. Certainly the use of messaging systems will minimize the amount of social exchange that accompanies a business meeting or telephone call.

Quality of work life. Job satisfaction may be threatened as the task variety and skill required to perform a job decrease. Previously mentioned factors such as stress, boredom, and isolation may also affect the quality of work life.

These positive and negative impacts should not be viewed as an inclusive list, nor should it be assumed that each of these impacts will occur. The interaction of organizations, technologies, and people will produce diverse responses to the change. Individuals who are responsible for the implementation should develop strategies which account for these potential impacts.

Human Resource Development/

Human Resource Management Issues

The potential psychological and behavioral impacts of new technologies on the workers present a significant

challenge for human resource development and human resource management(HRD/HRM) professionals. These professionals must be skilled change agents who can manage the change process and help employees cope with its effects. Issues to be adressed are:

Investigation of Widespread Organizational Changes. The HRD/HRM professional should investigate the changes that are occurring throughout the organization. Changes affected by the introduction of a new technology will occur in areas such as quality of work life, organizational structure, job satisfaction and motivation, and will emerge at the individual, group, and organizational levels.

Integration of new technology and skills with the job. An area which should receive particular emphasis is that of aiding the user in intergrating the new technology with his/her already established job activities. In order for the new technology to be used to its maximum effectiveness, the user must know not only how to use the new system/hardware, but when and where to use it. A critical factor which is often overlooked is what to do with the time that is saved. As technologies aid people in the efficient use of time, the user must learn how to effectively use the "saved" time.

Effective use of a technology is dependent upon the occurrence of two types of learning. First, is simply learning how to use the hardware. Turning on the machine, accessing the information system, and using

the video equipment are tasks that would occur during the first phase of learnino. The second phase is the most challenging as it is then that the user actually begins to assimilate the use of the new technology into his/her job, and experiments with the capabilities of the system.

Maintenance of enriched jobs. This is a challenging area for HRM professionals. Structuring the job around the needs of the worker is critical to maintaining the job satisfaction of the employee. Astasks become automated, the job will need to be redesigned to avoid boredom and the feeling of being a support person for a machine.

Training of System Designers. Training the system designer in the area of organizational behavior and organizational development will help to close the gap between the technology and the user. The instruction of system designers in the basic principles of human behavior and organizational change will contribute to the development of user friendly systems and an implementation process that supports change and acceptance.

Identification of a new set of managerial skills. As technology changes, so must the responsibilities of the manager. Automation is allowing for increased autonomy among workers and the opportunity to work away from the conventional office. As a result, managers will need to be able to supervise a several individuals in a variety of locations. Daily face to face contact may not occur, and

for the manager who uses an autocratic or close style of leadership, this may be a frustrating experience which challenges his/her managerial effectiveness.

Identification of new "styles" of work. Automation and its role will need to be incorporated into training and development programs. Programs on stress management can address automation as a source of stress, as well as a means of managing stress. For example, the use of a word processor can greatly improve the report writing process. Messaging systems can aid in contacting people that are typically difficult to locate, as well as help the user to control his/her own messages and interruptions.

Retraining. Retraining is certainly an issue that must be addressed when any type of new technology is introduced. Not only must users learn a new set of skills, but many workers may be "automated" out of a job. It is this set of workers that is ofspecial concern. If production workers are being replaced by robots, these displaced workers must be trained to assume a different role in the organization.

Summary

Researchers and practitioners must begin now to invetigate the impacts of automation on the workers and their environment. The implementation and use of new technologies will affect the quality of work life of employees, as well as society. Whether the evolution to an information

processing society and the "paperless office" is successful and improves productivity will depend largely upon the effectiveness with which the systems are introduced, integrated, and utilized in the work environment.

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